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Financial Developments in London in the 17th Century: The Financial Revolution Revisited

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A novel series of interest rates paid by the Corporation of London shows that interest rates in London declined by 350 basis points during the 17th century. The decline followed a similar pattern in Europe. Records from the Corporation's archive provide evidence for financial development: an increase in the number and volume of debt instruments, an increase in the number of lenders, and development of a secondary market. Econometric analysis establishes that increasing liquidity contributed to the convergence of interest rates between London and Amsterdam. England's financial evolution and path towards modern growth date to the 17th century.

Keywords: Interest rate, Financial Development, Financial Intermediation, Growth, England.

JEL codes: N2, N23, O16, O43, G23.

1 Introduction

Research on England's economic and financial history focused on the development of financial markets *following* the Glorious Revolution. Dickson's (1967) "The Financial revolution…1688-1756" was followed by North and Weingast (1989), who argued that institutional reforms, namely establishing credible commitment, enacted after the Glorious Revolution contributed to financial development and growth. Some of the key financial innovations were establishing the Bank of England (1694), a stock exchange, and a deep market for perpetual government securities. The main criteria used for the successful financial transformation and its most significant contribution to economic growth was evidence of declining interest rates. Few accounts debated the starting date of the financial revolution in England. Roseveare's (1991) "The Financial Revolution, 1660-1760" directly challenged Dickson's (1967) account.

In this paper, we turn to an overlooked aspect of financial development in England during the 17th century, when financial development was still in its infancy.[1] Our main contribution is a novel, annual series of interest rates paid by the Corporation of London to its lenders from 1638 to 1683 extracted from individual debt contracts from the Corporation of London's accounts.[2] We also provide quantitative evidence for the emergence of the Corporation of London as a significant financial institution in London's expanding financial market (Quinn 1997; Roseveare 1991). This allows us to suggest that the borrowing costs we document are indicative of those prevailing in London at the time.

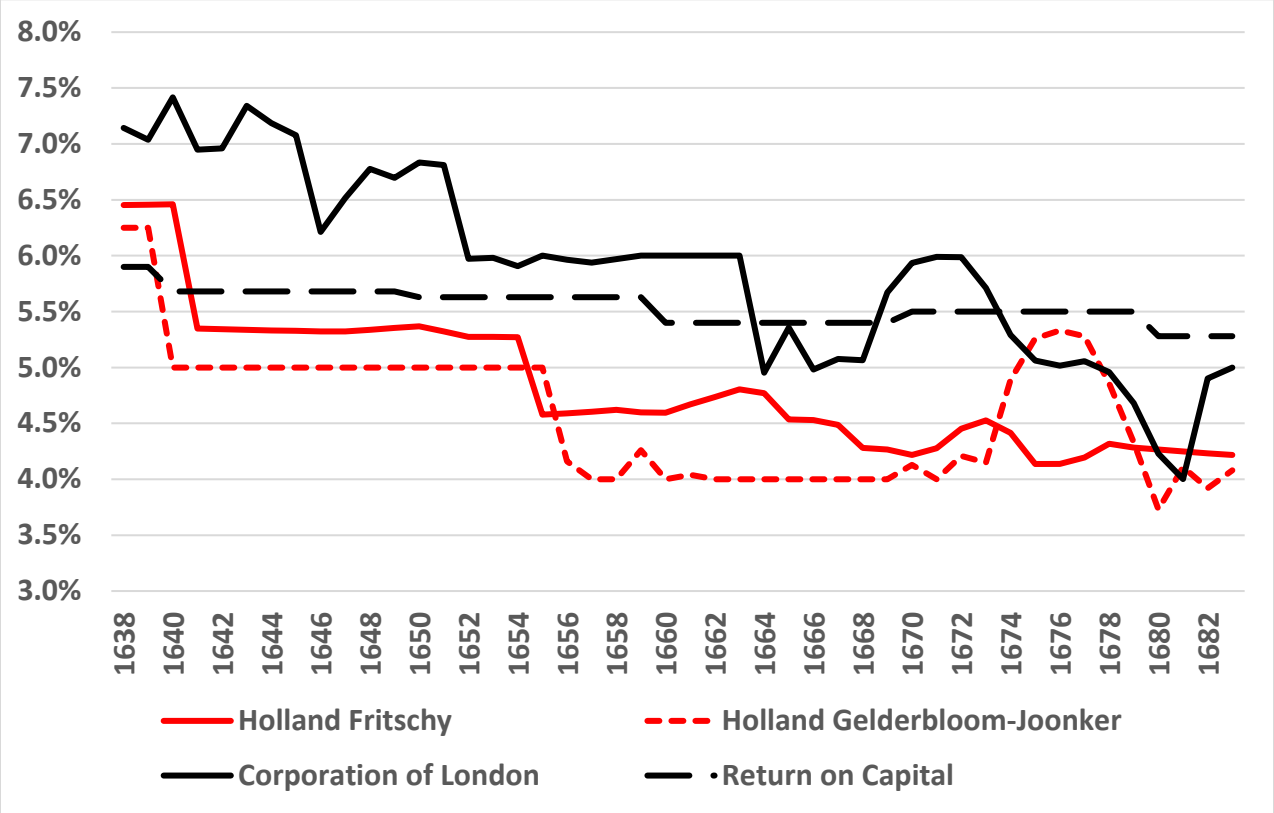
The main empirical finding (**Figure 1**) is that before the Glorious Revolution, interest rates in London declined in parallel to those in Amsterdam, the most developed financial center of the time (Carlos and Neal, 2011). The new series complements Clark's (2010) *real* return on capital.[3]

[1] The early history of the financial intermediation by the Corporation of London was studied by Ashton (1960) who mainly looked at the forced loans imposed on the Corporation before the Civil War. Carlton (1974) studied the Corporation of London's orphan's fund, which we analyze in (Coffman et al. 2020).
[2] We also extracted a shorter and incomplete series of interest rates paid by borrowers from the Corporation from 1616 to 1639, see section 1.2.
[3] Both series show a declining trend in the 17th century. However, as expected, real rates of return are less volatile than nominal financial returns that exhibited a sharper decline.

Therefore, interest rates in London during the 17th century exhibited a similar declining trend to that observed in other parts of Europe.[4]

Figure 1 also shows that significant *convergence* between London and Amsterdam was also achieved by 1680 when interest rates reached 4%. This development contrasts with the divergence of interest rates that followed the Glorious Revolution in 1688 and lasted until the 1730s (Sussman & Yafeh 2006). We attribute the *convergence* of interest rates between London and Amsterdam to financial deepening.

Figure 1
Borrowing cost of the Corporation of London and Province of Holland: 1638-1683



Sources: London: COL/CHD/LA/01/001-002; COL/CHD/CT/01/002-017. Borrowing rates weighted by loan amount. Return on Capital from (Clark 2010, table 7)
Province of Holland: average cost of debt from Wantje Fritschy Gewestelijke Financiën ten tijde van de Republiek der Verenigde Nederlanden 1572-1795
Province of Holland G-J: market prices communicated by Gelderbloom and Jonker.

[4] See Epstein (2000) and Stasavage (2011) for Europe, (Hoffman et al. 2000) for Paris, (Chilosi et al. 2018) for Italy and Germany and (Schmelzing 2020) for an updated European and global data on interest rates.

Kiyotaki and Moore (2005) present a financial deepening model, where interest rate differentials represent a liquidity premium. According to that model, as financial deepening progresses, the liquidity premium goes down, and with it, interest rate differentials. The IMF recently compiled indices of financial deepening (Sahay et al. 2015). The indices include two broad categories – financial institutions and financial markets. Sub-indices of financial development include the variety of instruments, their marketability, spreads, and measures of financial intermediation to GDP (Sahay et al. 2015).

At the aggregate level, we show that from the 1660s, The Corporation of London's debt levels relative to British GDP increased significantly and that the cost of that capital declined. On the microeconomic level, the Corporation of London used four debt instruments: annuities, bonds, notes, and very short-term loans. We provide evidence of the development of a secondary market for debt. We also document an increase in the number of people holding bonds and their heterogeneity and the variety of debt maturities.[5] While the developments we document are modest compared with those of the 18th century, they contributed to the decline in the cost of capital in London.

Like its successful continental counterparts (Stasavage 2011), the autonomous Corporation of London managed to borrow at a lower cost than its sovereign because it enjoyed greater credibility than the Crown. Unlike Stasavage's grim conclusion that city oligarchies became rentier societies siphoning credit to unproductive uses, the Corporation of London borrowed to the hilt to rebuild a modern city (Coffman et al. 2020), financed the Crown, and provided social security to its orphans (Carlton 1974).

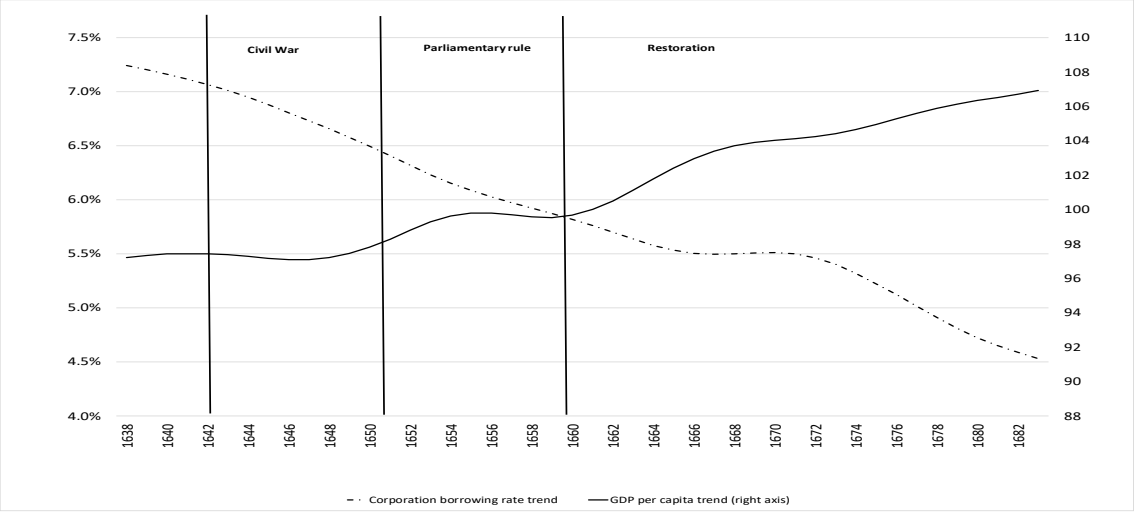
The declining interest rates we observe in the data were also the manifestation of financial deepening embodied in a rising stock of debt that increased liquidity (Gorton & Pennacchi 1990). More liquid capital markets and lower cost of credit following the Restoration helped propel the English economy forward (Broadberry et al. 2011). Our findings, therefore, support the view that the break from the Malthusian trap and the accelerated growth that led to the Industrial Revolution in England began by the mid-17th century (e.g., Clark (2005), Kelly & Ó Gráda (2016) and

[5] Our findings supplement earlier accounts on the rise of the goldsmith-bankers (Quinn 1997). We do not argue that the Corporation of London developed the secondary market, but that our findings represent the financial developments of its time.

Broadberry et al. (2015)). Figure 2 shows a strong correlation between the decline in the cost of capital and increases in real GDP per capita. The picture that emerges is a close association between financial development and economic growth (Levine 2005).[6]

Figure 2

Corporation of London Borrowing rates and GDP per capita: 1638-1683



Sources: London: Corporation of London COL/CHD/LA/01/001-002; COL/CHD/CT/01/002-017. Borrowing rates weighted by loan amount. Real GDP from Broadberry et al. (2011). The population of England from Clark (2010). GDP per capita is an index with 1660=100. The trends are based on an HP filter.

Our study relates to the debate sparked by North and Weingast on the contribution of the Glorious Revolution to financial development and growth. Clark (1996) showed that real interest rates measured as the return to capital were not significantly affected. Sussman and Yafeh (2006) showed that interest rates increased for more than three decades after the Glorious Revolution. Subsequent research offered a more nuanced view of the Glorious Revolution's impact on financial development and economic growth.[7] It emphasized the change in the ability of the state to rule efficiently and raise taxes to finance wars and debt (e.g.: ('O'Brien 2011); (Cox 2012); (Pincus & Robinson 2014)). Another strand of the literature emphasized the effects of partisan politics and

[6] Calderón & Liu (2003) provide evidence that the direction of causality run from financial development to growth.
[7] For the sake of not repeating the extensive arguments raised in this debate, I refer the reader to excellent summaries of the debate in Cox (2012); Coffman et al. (2013), in particular Coffman (2013) ; Pincus and Robinson (2014); Hodgson (2017); Dimitruk (2018).

the growth-enhancing economic policies of the Whig party (e.g.: (Stasavage 2007); (Pincus & Robinson 2014)).

Recent accounts argue that the Glorious Revolution was not about securing property rights but about enabling Parliament to effectively transfer landed property rights. This brought a more efficient allocation of resources and the development of capital markets. (e.g., (Bogart 2011); (Bogart & Richardson 2011); (Hodgson 2017); (Dimitruk 2018)). The emphasis on the Glorious Revolution as a watershed in the development of efficient (capital) markets fits with research that claims that Britain's (legal) institutions were more conducive to the development of efficient financial markets (Glaeser and Shleifer 2002) and the extensive empirical literature that followed (La Porta et al. 2008).

Our aim is not to dispute the contribution of the Glorious Revolution to British economic history. We provide novel evidence that shows that interest rates in London declined during the 17th century, before the Glorious Revolution and in parallel with their decline in Continental Europe. More importantly, the Restoration of the Stuart monarchy in 1660, despite initial apprehensions, was associated with financial deepening. Financial development brought about the convergence of London interest rates with those of Amsterdam – the most developed financial center of Europe.

The financial operations of the Corporation of London from the Restoration to the Glorious Revolution are understudied. Ashton (1960) studied its financial importance before the Civil War. Richards (1929) characterized its role as a financial intermediary to the Crown (similar to the goldsmith-bankers, only on a larger scale) Coates (2017) studied the period of financial difficulties of the Corporation during Civil War. Wareham (2011) discusses the period before the Fire and the levying of the hearth tax on the City. The history of the Orphans' fund was described by Carlton (1974) but was not placed in the broader context of the Corporation's financial operations. Harding (2003) provides a broad history of the City of London's finances from 1400 to 1700 but provides little quantitative evidence.

Our findings also relate to the literature on municipal borrowing and taxation by cities and provinces in early modern Europe. Epstein (2000) and Stasavage (2011) highlight the relationship between municipal autonomy and the cost of capital. More recently, research has focused in more detail on individual European cities. (Baguet 2016; Colombo & Dotti 2015; Limberger & Ucendo 2015) , some of which look particularly at the role of political-economic elites in municipal debt

markets (Baguet 2016). Finally, data on municipal borrowing rates in Europe in the long-run was collected and analyzed by Chilosi et al. (2018).

The rest of the paper is organized as follows: Section 2 describes the lending and borrowing by the Corporation of London and provides quantitative evidence on the financial deepening as reflected in the accounts of the Corporation. In Section 3, we present the methodological framework and report the results of our econometric analysis. Section 4 provides an analysis of the spread between secured and unsecured debt. Section 5 concludes.

2 Lending, borrowing, and interest rates based on the Corporation of London accounts

In this section, we provide a novel, annual series of interest rates for the 17th century. We extracted the data from the accounts of the Corporation of London. The data comprises the borrowing accounts of the Corporation of London (1638 to 1683). We supplemented it by a short series on lending by the Corporation of London (1616 to 1639). We also present data on amounts borrowed and various characteristics of the market for the Corporation of 'London's debt. Finally, we show the distribution of loan amounts and loan maturities.[8]

The Corporation of London was a chartered corporation that originated in the 12th century. Its governance structure included the Lord Mayor, the Court of Aldermen (executive branch), and the Court of Common Council (a deliberative institution).[9] In the 17th century, it enjoyed autonomy and was essentially an oligarchy of wealthy merchants with mainly Whiggish inclinations.[10] The Corporation of London was an important factor in the politics of the Restoration period (De Krey, 2005).

The accounts we studied reveal that the Corporation of 'London's financial activities intensified during the 17th century. The Corporation not only governed the City and regulated its guilds. The accounts we studied reveal that the Corporation of 'London's financial activities intensified during the 17th century. The Corporation not only governed the City and regulated its guilds but can also be characterized as a financial intermediary. The city operated, since the middle ages, an Orphan's fund (Carlton 1974; Doolittle 1983) Guild members deposited money in the fund that earned

[8] We provide more details on the lenders and the socio-economic situation in Coffman et al. (2019a).
[9] See City of London fact sheet: https://web.archive.org/web/20130815012629/http://www.cityoflondon.gov.uk/about-the-city/history-and-heritage/mansion-house/Pages/History-of-the-Government-of-the-City-of-London.aspx
[10] See Unwin (1908) and Roseveare (1991).

interest and was payable as an annuity to orphan's before they reached the age of majority. Having reached the age of majority the funds could be withdrawn. As we show below, before the Civil War, the Corporation used part of the proceeds of the Orphan's fund to lend to individuals and companies

The Corporation also acted as a financial intermediary between individuals lenders and the Crown before the Civil War (Ashton 1960; Richards 1929 [11].It also lent directly to the Crown before the Civil War and after the Restoration. After the Restoration, it used the Orphan's deposits to lend to the Crown until the Fire of London (1666) placed a heavy burden on City finances (Nichols 1971).[12] Coffman et al. (2020) show that Parliament authorized the Corporation to establish a Coal Cash Fund responsible for the financial management of the rebuilding of public buildings after the Fire of 1666. The Corporation lent to the Coal Cash Fund to expedite the rebuilding projects. Ultimately the financial strains of reconstruction led to the Corporation's default in 1683.

The Corporation of London's financial activities were, therefore, similar to those of their counterparts on the Continent, especially in the Low-Countries. However, historians and economic historians hardly researched its financial operations.[13] Therefore, Munro (2003) and Carlos and Neal (2011) arrived at their conclusion on London's financial development's unique history based on incomplete data.[14] Establishing that the City of London was comparable with continental cities allows us to suggest that its cost of capital and the financial developments we document could represent non-sovereign borrowing in London during the Restoration and before the Glorious Revolution.

Our data analysis ends in 1683. In that year, the Corporation of London suspended interest payments on its unsecured debt. In Coffman et al. (2020), we suggest that the default resulted from higher than expected commitments and insufficient cash flows related to the reconstruction of the infrastructure and public buildings of the City destroyed in the Fire of 1666. A few months after the default, in October of 1683, the King suspended the Corporation of London's privileges in what

[11] This was similar to the role played by the Hotel de Ville in Paris (Moulin 1998).
[12] Data extracted from Treasury Books Calendar volumes 1-2, show that the corporation lent £350,000 from 1661 to 1668. .
[13] Notable exceptions are (Harding 2003); (Kellett 1958), (Wren 1948); (Wren 1949);.
[14] London is also, also missing from the comprehensive analysis by Stasavage (2011), who studied in detail the debt of autonomous cities in Europe See Table 2.1 p. 31. One can argue that London was 'autonomous' but not a 'city-state' and therefore, does not qualify to be included in the analysis.

is known as the 'Quo 'Warranto' act.[15] Parliament restored the privileges in 1688, immediately after the Glorious Revolution. However, the Corporation of London, riddled with debt in default, did not resume its role as a financial intermediary. Subsequent financial development in England proceeded on the well-known and heavily researched trajectory.

2.1 The Sources

We extracted our data from the Chamberlain's account books kept at the London Metropolitan Archive. The 'Cash 'Books' contain the borrowing and lending activities of the Chamberlain of the Corporation of London from 1633 until 1648.[16] As was customary in the accounts of the time, borrowing was recorded in the receipts '('charges') section. There was no distinction between an operating budget and a capital account.[17] From 1649 to 1683, the Chamberlain kept the detailed financial accounts in a separate ledger – the 'Loan Books.'[18] The Cash Books listed only the totals.

The accounts detail the origination date of the loan, the name/s of the lender/s, their gender (widows or spinsters), and whether they resided outside of the City of London. The records provide information on the lenders' status, whether they belonged to the gentry (gentlemen, esquire, and nobility), the City government, and the livery companies (usually with specific occupations listed). They also record the amount lent, the nature of the loan (very short-term loan, six 'months' loan or annuity), and the rate of interest on the loan. The accounts also record the redemption of the loan and the name of the person receiving the principal. This information allows us to establish whether the loan was assigned to another person.

We extracted additional accounting data from the Cash Books. They include annual receipts, expenditures, and balance sheets. The provision of a detailed annual balance sheet, including assets and liabilities, started to appear in the Cash Book in the fiscal year 1654. The fiscal accounts ran from Michaelmas to Michaelmas (29 September). The accounts allow calculating the Corporation's annual operating deficit (excluding borrowing and debt redemptions) and the

[15] Roseveare (1991).
[16] The Cash Books consulted were COL/CHD/CT/001 to 019. For an early analysis see (Wren 1949)
[17] For a detailed explanation of the accounting system used by the Chamberlain of the Corporation, see: 'Introduction: Medieval accounts and their arrangement,' in *Chamber Accounts of the Sixteenth Century*, ed. Betty R Masters (London, 1984), pp. ix-xxxii. *British History Online* http://www.british-history.ac.uk/london-record-soc/vol20/ix-xxxii.
[18] The Loan book consulted were COL/CHD/LA/001, and 002.

'Corporation's stock of debt and additional financial ratios. The accounts are complete except for the ledger for the years 1665 to 1667, which burned in the London Fire.

2.2 Lending by the Corporation of London

The Corporation of London advanced loans to individuals and companies before 1640. Afterward, the Corporation of London started to borrow from individuals and no longer lent them. Since surviving records began in 1633, we have detailed lending data only from 1633 to 1640. We used the stock of unpaid debt borrowed from the Corporation of London to infer, albeit from an incomplete sample, the lending rates before 1633.

2.2.1 The loans

The Corporation of London lent directly to wealthy individuals and two companies; the East India Company and the Company of the Merchant Adventurers of London. The Corporation also administered the forced loans levied by the Crown (Ashton, 1960). The loans made by the Corporation were extended initially for 6 or 12 months and were approved by the '*consent of the court (of Aldermen)*." The Corporation made these loans without asking for collateral. The stock of unpaid debt also includes several loans made in the 1620s that were in default.[19] These loans were part of the forced loans imposed by the Crown on the Corporation in 1616 and 1625 that were unpaid (Ashton 1960).

Table 1
Summary statistics of unsecured lending by the Corporation of London: 1616-1640

Number of loans	Number of borrowers	Total lent	Mean	Median	Min	Max
121	115	£ 181,695	£ 969	£ 650	£ 25	£ 4000

Sources: COL/CHD/CT/001-003

Table 1 provides summary statistics for the unsecured lending we extracted from the account books. The average loan totaled about £1000, while the median loan was £650. Depending on various assumptions, £1000 are worth today between £150,000 to £2,250,000.[20] We can compare these loans to lending by ' 'Hoare's Bank from 1695 to 1724. Temin and Voth (2013) showed that

[19] We infer that the loans were in default from accrued interest charges and the absence of current interest payment.
[20] Calculation based on measuring worth website https://www.measuringworth.com/index.php

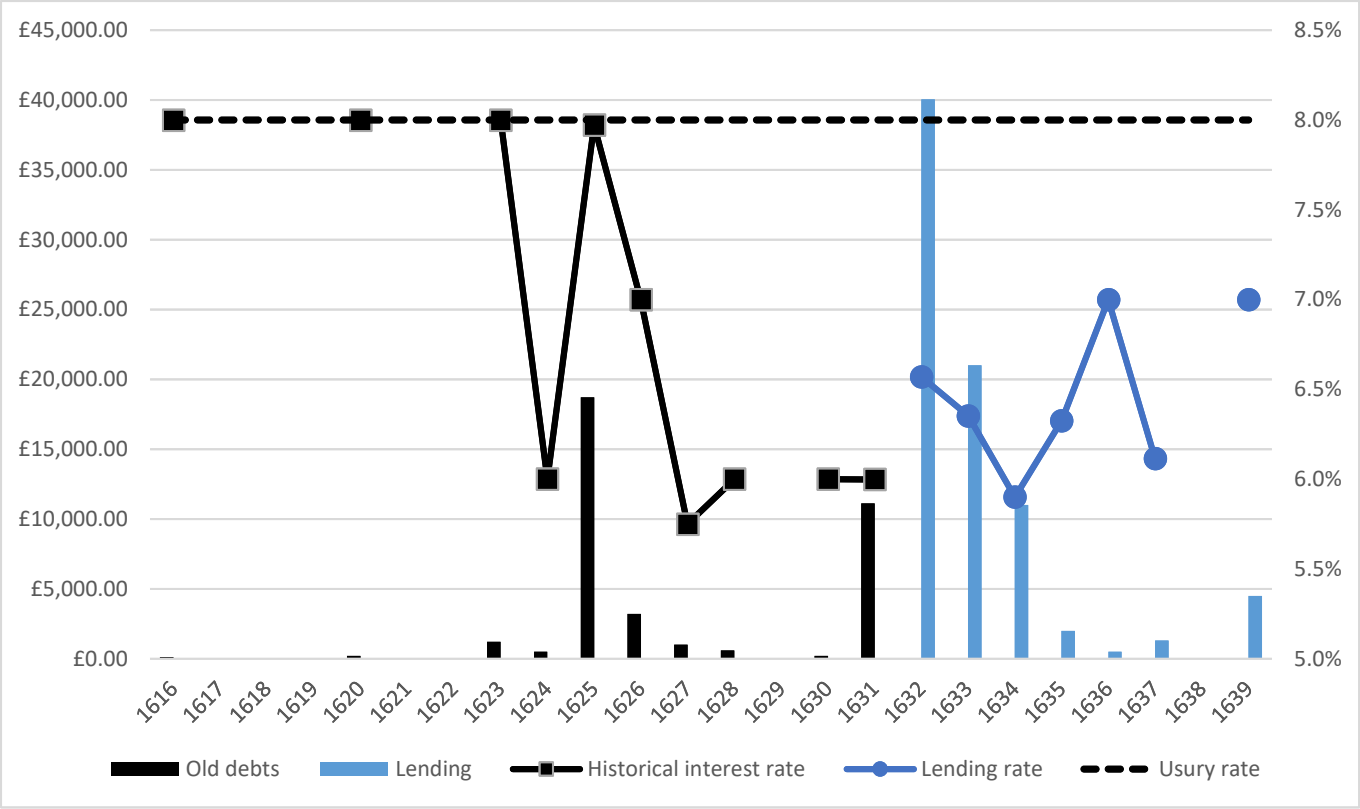
the average loan made by ' 'Hoare's was £1040. This amount was similar to the one we calculated for the Corporation of London.

The accounts of the Corporation of London reveal that it lent to the East India Company and the Company of the Merchant Adventurers. The East India Company borrowed £15,000 a year from 1632 to 1635 and £12,000 in 1636 at 6%. In 1639, it borrowed only £5,500 at 7%. The borrowing by the Company of Merchant Adventurers was more modest than that of the East India Company. It borrowed £2,000 at 6% in 1632 and 1633 and £1,500 at 6.5% in 1634 and 1635.

2.2.2 Lending rates

Figure 3

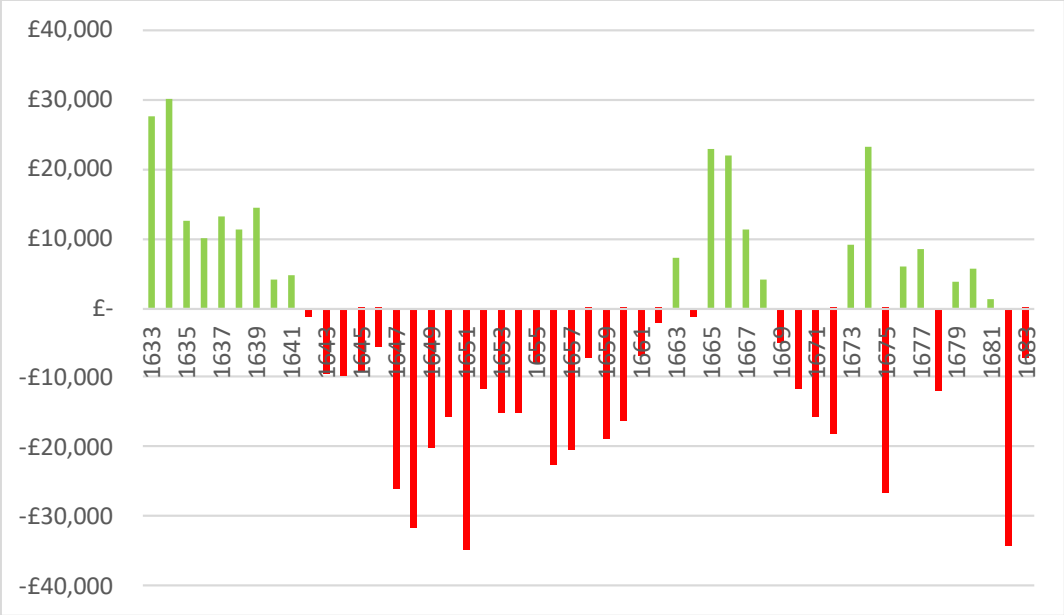
Corporation of London lending: 1616-1640



Sources: COL/CHD/CT/01/001-003.
Old Debts and historical interest rate based on the stock of outstanding debt owed to the City in 1633 (COL/CHD/CT/01/001). Lending and lending rate based on reported actual lending.

We show the lending rates charged by the Corporation of London and amounts lent in **Figure 3**. Interest rates declined from the usury ceiling of 8% in 1625 to 6% during the 1630s and then increased to 7% in 1640. We can compare the loans made in the 1630s with those made by Hoare's Bank after the Glorious Revolution. Temin and Voth (2013) report that the usury ceiling of 6% constrained Hoare's lending rates until 1714 and 5% after that. Therefore, they argue that administrative rather than market forces dominated lending rates. Our data show that almost a century *earlier*, the Corporation advanced equal-sized loans (on average) at *market* rates. We also show that lending rates, albeit to privileged borrowers affiliated with the City's government, in the 1630s were similar to those that prevailed a century later, decades after the Glorious Revolution.

Figure 4
The cash flow of Corporation of London: 1633-1683



Sources: COL/CHD/CT/01/001-17.
Cash flow is equal to the cash balance reported in the account minus the cash obtained by borrowing.

2.3 Borrowing by the Corporation of London

The Corporation of London started borrowing from individuals in 1638. From 1640, it faced borrowing needs as its cash flow, which before then was positive and allowed it to lend, became negative for most years (***Figure 4***). In this subsection, we begin by detailing the loans' characteristics to establish our hypothesis that financial deepening occurred in London during this

period. We will show the types of debt contracts used, their duration, volume, and their liquidity. We then present the interest rates at which the Corporation of London borrowed.

Borrowing

The Corporation of London borrowed money from individuals to cover its deficits. These loans were secured only by the Corporation's reputation. The accounts record them as "*borrowed for the "City's use on the City's bond.*" Habakkuk (1952) cites Benbrigge's *Usura Accommodata* from 1646, claiming that the City's Chamber was a place "*whereunto men may put their moneys, for the assurance whereof, and the payment of its use (which is five in the hundred per annum), they have the security of the Chamber, which is accounted the best this day in England."*[21]

Table 2 provides summary statistics for the unsecured borrowing we extracted from the account books. The accounts record 2184 loans advanced by 1203 individuals for a total of almost £920,000 over 40 years. The average loan totaled about £419, while the median loan amounted to £200. These were substantial investments, £200 then are worth today, between £30,000 to £450,000.[22]

The Crown's default in 1672 – the stop of the exchequer – allows putting the lending to the Corporation of London in perspective. Carruthers (1999 p. 66) provides figures for the average amounts of debt assigned to the Crown's individual creditors. The goldsmith-bankers intermediated lending to the Crown. The average loan was £475 and is close to the average amount of borrowing by the Corporation. The average assigned loan held by a female was £294, which is similar to the average loan size of women to the Corporation - £284. We can conclude that lending to the Corporation was an investment comparable to sovereign lending by individuals.

[21] Footnote 4 and page 5 in the original.
[22] Calculation based on measuring worth website https://www.measuringworth.com/index.php

Table 2
Summary statistics of unsecured borrowing by the Corporation of London: 1638-1683

Number of loans	**Number of Lenders**	**Total Borrowed**	**Mean**	**Median**	**Min**	**Max**
2184	1203	£ 918,715	£ 419	£ 200	£ 5	£ 7100
Distribution of lender types/Share of total lending						
Aldermen	**Gentlemen**	**Livery members**	**Widows**	**Spinsters**	**Non-City**	
2% / 9%	25%/40%	33%/26%	18%/11%	16%/9%	6%/5%	
Distribution of loan types / Share of total lending						
Bonds	**Annuities**	**Notes**	**On-Demand**			
83%/82%	2.2%/1.5%	4.6%/3.2%	10.2%/13.2%			
Loan duration in months						
Number of loans	**Defaulted loans**	**Weighted mean**	**Median**	**Min**	**Max**	
2184	246	43.6	24.5	1day	42 years, 6months	
Assigned loans						
Third-Party	**Husband**	**Heirs**	**Total**	**Total amount**		
5.7%	2.7%	6.5%	14.9%	£ 118,565		

Sources: COL/CHD/CT/001 to 019; COL/CHD/LA/001 and 002.

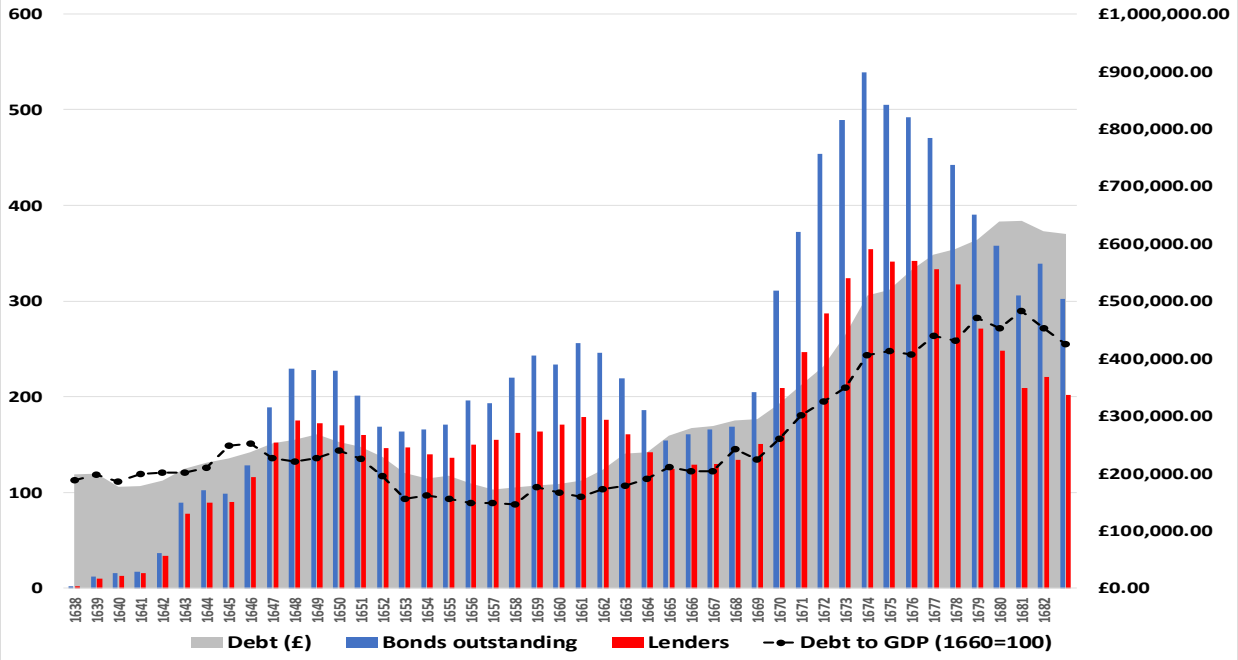
2.3.1.1 The volume of debt and bonds

An important measure of financial deepening is the ratio of financial assets to GDP (Sahay et al. 2015). The Corporation of London started to borrow using bonds in 1638, although it had already administered an orphans' fund dated to the middle ages. We can see (**Figure 5**) that debt volumes rose during the English Civil war and declined during the Interregnum. Debt volumes increased again following the Restoration, and especially after the London Fire of 1666 and the reconstruction carried out by the Corporation. We can scale the debt volumes by British GDP (Broadberry et al. 2015) and show that this ratio did not exhibit a trend until the Restoration. However, after 1660 the Corporation of London's debt to British GDP ratio tripled.[23]

[23] One may argue that following the Stop of Exchequer in 1672, loans to the Corporation of London substituted lending to the Crown and therefore do not provide evidence for financial deepening. However, the debt to GDP ratio increased by 2.5 times before 1672 and did not increase during the period of default, it increased to 3 times its rate in 1660, only in 1679-81 when the financial crisis of 1672 was already over.

Since London experienced rapid growth in the 17th century, one may argue that to capture financial deepening we should scale the Corporation's debt by London's GDP. Unfortunately, the figures for London's GDP do not exist. London's population increased by less than 50% - from 400,000 in 1650 to 575,000 in 1695 (Wrigley 1967), whereas the Corporation's debt tripled. One may also question the representativeness of the debt expansion of the Corporation. Unfortunately, we do not have quantitative data on the activity of other financial institutions. The expansion of the goldsmith banks after the Restoration (Quinn 1997), the ability to finance the rebuilding of London after the Fire (Coffman et al. 2020), and its spatial expansion, suggest that the expansion of the Corporation debt was not unique.

Figure 5
Measures of financial deepening: Debt volumes, debt to GDP, number of loans outstanding, and number of lenders: 1633-1683



Sources: COL/CHD/CT/001 to 019; COL/CHD/LA/001 and 002.

The balance sheet of the Corporation of London was larger than of goldsmith banks. Before the Restoration, the Corporation's balance sheet averaged around £200,000 and tripled to £600,000 in the 1680s. In contrast, according to Temin and Voth (2013), the assets of individual Goldsmith Banks from 1688 to 1730 were in the range of £100,000 to £200,000. The rise of the Corporation's debt following the Restoration could not be considered as insignificant.

Financial deepening is also represented by the number of bonds and the number of lenders holding the Corporation's debt instruments. The data show (**Figure 5**) that the number of individuals holding the Corporation's debt increased during the first decade of borrowing to around 150 and remained at this level until 1669. It then increased rapidly to levels higher than 300. The number of bonds outstanding followed a similar trend; More than 500 bonds were outstanding in 1674. In all, the data show that the Corporation of London's borrowing was associated with significant financial deepening. Moreover, the exogenous event of the Fire of London that strained the finances of the Corporation accelerated these developments.

2.3.1.2 Who were the lenders?

The Corporation of London borrowed mainly from wealthy residents of the City (**Table 2**). The documents classify the lenders into five categories: 1) members of the Corporation's governing body (Aldermen). They accounted for 2% of the loans, but 9% of the amount lent. The alderman can be considered as insiders – lending to the institutions they governed. 2) gents and esquires that resided in the City. They provided 25% of the loans and 40% of the amount lent. 3) members of livery companies (guilds) that supplied the largest share of loans (33%) and 26% of the amount lent. 4) widows that provided 18% of the loans and 11% of the amount lent. 5) spinsters that provided 16% of the loans and 9% of the amount lent. Independent women, therefore, provided 23% of the loans and 20% of the amount lent. 6) a small subset of lenders did not reside in the City. Many resided in London and some in the surrounding shires. They accounted for 6% of the loans and 5% of the amount lent.

Lending to the Corporation of London increased the variety of assets Londoners could hold. Records of Backwell Bank – one of the three most prominent goldsmith banks that operated in London after the Restoration (Quinn 1997; Richards 1929) – allow us to show that 322 of the 1203 lenders to the Corporation (27%) also held bank accounts in that bank.[24] Our records show that those with bank accounts with Backwell lent on average significantly larger amounts to the

[24] We used the *Customer account ledgers of Edward Backwell, 1663-72* and matched the names of depositors with names of lenders to the Corporation.

Corporation than those who did not have an account with Backwell.[25] The share of women who lent to the Corporation and had an account with Backwell was only 13%.

The list of assignees of the royal defaulted debt, during the 'stop of the exchequer,' includes all goldsmith bankers. The lists show that women represented 14.6% of creditors (Carruthers 1999, p. 66). Though we have data from only one, albeit the largest bank in London and the list of assignees of royal debt from 1672, we can conclude that the Corporation of London offered an additional comparable investment opportunity allowing individuals to diversify their portfolios. More tenuously, we can conclude that the Corporation of London offered investment opportunities to those that did not have access to bank accounts, especially women. These findings support our hypothesis that the Corporation of London contributed to financial deepening following the Restoration.

The evidence that individuals that lent to the Corporation also held accounts at Backwell's Bank establishes that the Corporation of London was integrated within the London financial market. Its lenders always faced the option of either depositing funds at a Bank or lending to the Corporation. Therefore, we can argue that the Corporation competed with London Goldsmiths and offered the option to diversify financial investments. The Goldsmith Banks were integrated and part of the financial information network with continental Europe and, in particular, with Amsterdam (Neal & Quinn 2001). Therefore, though not directly exposed to Amsterdam's capital market, the Corporation of London was likely integrated with it through its competition with Goldsmith Banks.

2.3.1.3 Debt Contract types

In this subsection, we present evidence that the Corporation of London offered a variety of debt contracts that differed in their initial liquidity (minimal holding period) and also provided flexible withdrawing options in terms of maturity and repayment options. All debt contracts were unsecured, and they were not issued against collateral or assigned (tax) revenues. During the City's reconstruction after the Fire of 1666 (from 1671 to 1677), the Corporation also issued bonds secured by secured the Coal Tax receipts.[26]

[25] We can reject the hypothesis that both the median amount lent and the average amount lent are equal.
[26] These bonds were issued by the Coal Cash fund which was an independent entity run by the Corporation of London's Chamberlain. We analyze in detail the finances of the rebuilding of London in Coffman et al. (2020).

In 1638, when borrowing began to 1662, most of the loans were recorded as ***bonds*** borrowed for six months. In effect, most loans were repaid after longer periods (**Table 2**). In 1663, the accounts stopped mentioning the duration of the bonds altogether.[27] Thus, we can characterize them as bonds with a flexible redemption option making them a liquid investment. The loans were contracted at a given interest rate, which could vary between lenders. During their holding period, the bonds were subject to variable interest rates, based on prevailing borrowing costs. Only a small number of loans (2% of the total borrowed) were life rents or annuities.

When the Corporation needed immediate liquidity, it raised loans recorded as loans to "*cover the want of cash,*" which could be repaid within a very short period. These loans amounted to more than 10% of the total. On average, they were of a higher value, and their median holding length was half that of bonds (17 months). Finally, the Corporation also issued ***notes*** (similar to the royal exchequer notes). These debt instruments amounted to 4.6% of all loans, were of lower value than bonds, and were held for even shorter durations (median holding period of 11 months).

The Corporation, therefore, issued a variety of debt instruments that varied in their minimum holding period. However, none of the debt instruments had a maximum redemption maturity, and most of them were redeemed on the lenders' demand, well after the minimal contractual holding period expired. Another interesting aspect of the debt contracts is that they could be redeemed in installments. The Corporation repaid about 17% of all loans in installments: 9% of loans were repaid in two installments, 3.5% in three installments, and the rest repaid in 4 to 14 (one loan) installments.

2.3.1.4 The bonds' maturities

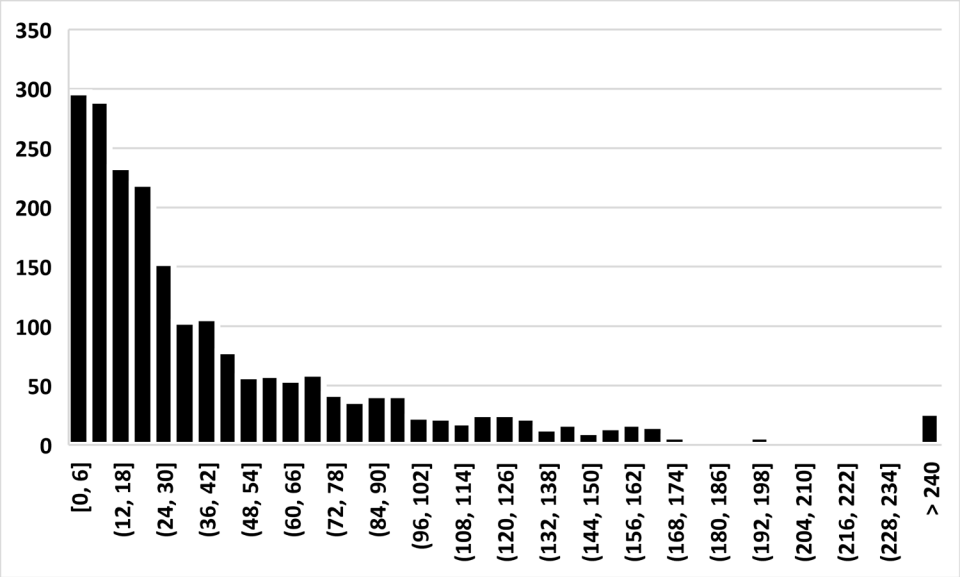
As we saw above, except for a small share of annuities, most of the lending to the Corporation was under short term contracts. However, the lenders had the option of holding the debt instruments beyond the initial contract period. Therefore, de facto, the Corporation was able to raise long-term debt and, at the same time, offering a liquid investment to the investors. **Figure 6** shows the distribution of the holding periods. About a third of the loans were redeemed within 18 months, and the median was about two years. However, about a quarter of loans were held for periods

[27] This is similar to the practice in Holland (Gelderblom & Jonker 2004) and to earlier forms of city finance like *rentes* that can be treated as annuities (Munro 2003).

above five years. Ten percent of the loans were held for more than ten years.[28] While most of the investments in the Corporation's bonds were, therefore, held for short maturities, these debt instruments allowed the investor to keep them for longer periods. For some investors, the bonds served as an annuity.

Figure 6

Distribution of loan maturities in months: 1640-1683



Sources: COL/CHD/CT/001 to 019; COL/CHD/LA/001 and 002.

The data on loan redemptions show that the median duration of redeemed loans increased almost threefold during the Interregnum, from 20 to 60 months (**Figure 7**). It seems that the Corporation was able to establish its credibility as a borrower during the Civil War and was subsequently able to borrow for longer maturities. During the 1670s, the median duration of redeemed loans declined to three years and then increased back to five years in 1681. We may explain this by noting that the early 1670s were when the Corporation increased its demand for loans to finance the reconstruction work after the Fire of 1666. Simultaneously, the Stop of the Exchequer in 1672 and the related failure of some goldsmith banks may have increased the demand for more liquid investment opportunities.

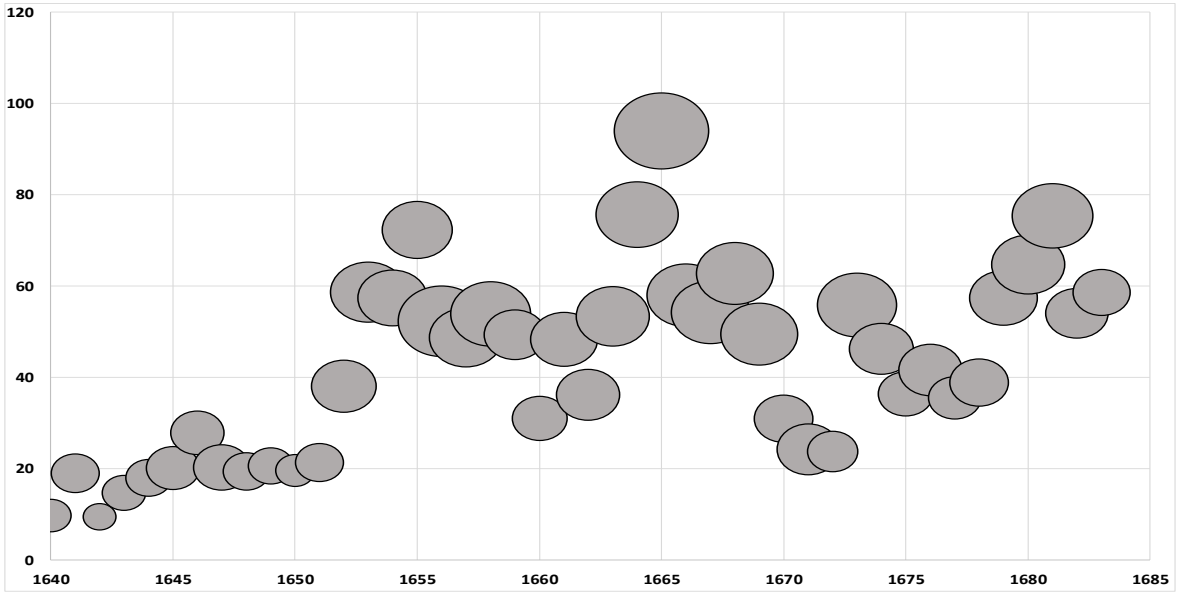
[28] Because the Corporation defaulted in 1683 the durations are biased downwards as we do not have the maturity of the loans taken out in the last years before the default.

The loans' maturity also depended on the lenders' characteristics and the type of debt instrument used. To determine what affected the holding periods of individual bonds, we estimated a survival model on the length of time loans were held until redemption. We report the estimation results in the Appendix (Table A-7). Controlling for the year of redemption fixed effects, we found that loan duration decreased with the amount lent. i.e., large loans were held for shorter durations. We also found that loans advanced by insiders – the Aldermen – were held for 40 percent shorter durations than those advanced by liveries members. On the other hand, loans by widows were held for about 30 percent longer. Annuities were held for periods twice as long as regular bonds and notes, and short-term debt was held for nearly half the bonds' duration. Those that withdrew their loans in installments held them for 60% longer than others. Finally, bonds assigned to third-parties were held for almost twice as long as those redeemed by the original lenders.

Evidence from loan maturities allows us to conclude that lending to the Corporation provided lenders with debt instruments that suited their preferences. On the one hand, widows that held smaller bonds held them for much longer durations – serving as an equivalent to an annuity. Insiders, on the other hand, lent large amounts for shorter durations.

Figure 7

Loan maturities in months at redemption: 1640-1683



Sources: COL/CHD/CT/001 to 019; COL/CHD/LA/001 and 002.
Note: We plot the median duration of loans redeemed in each year. The size of the bubble indicates the total amount of debt redeemed each year.

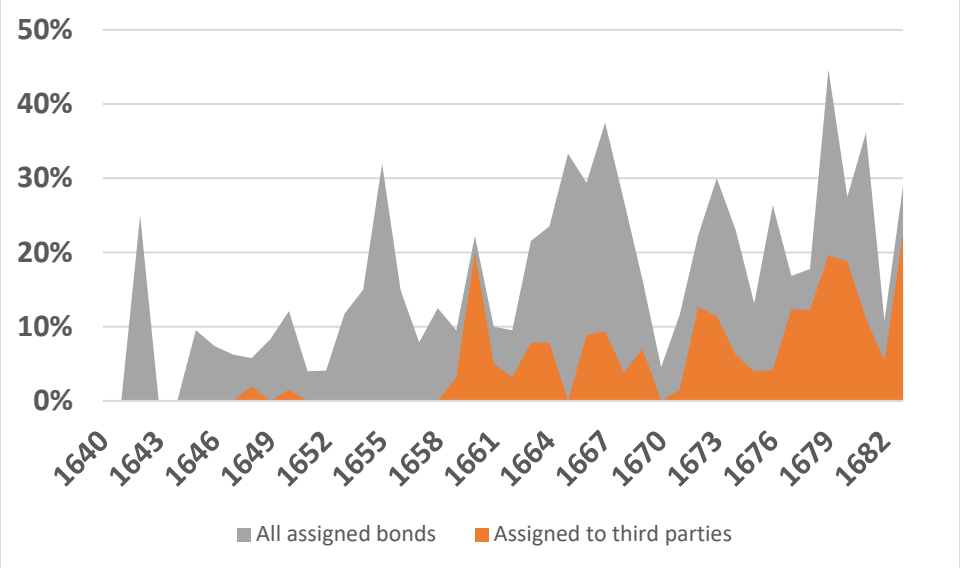
2.3.1.5 A secondary market for debt

When the Corporation paid back the loans, the records mentioned the name of the person paid. If that person was not the original bondholder, they recorded the name of the assignee. The records show (**Table 2**) that 15% of the loans were assigned. Natural cases for assignments were when lenders died and when women were married. Married women's financial assets were legally required to be held by the husband. However, about 6% of all loans worth over £41,000 were assigned to third parties.

As we saw in the previous section, assigned loans were held for longer durations than unassigned loans, suggesting that those that bought them did so for investment purposes. Recall that investors could cash their bonds after six months. Moreover, only 4 of the assigned bonds were cashed six months after their issuance. Since we have no record of the assignment transaction, we do not know when it took place in the bond's life. We can only observe bonds when they are redeemed. Nevertheless, we can see that the share of assigned bonds redeemed increased over time (**Figure 8**). In particular, we note that assignability to third parties was rare before the Restoration.

Figure 8

Share of bonds redeemed by assignees: 1640-1683



Sources: COL/CHD/LA/01/001, and 002.

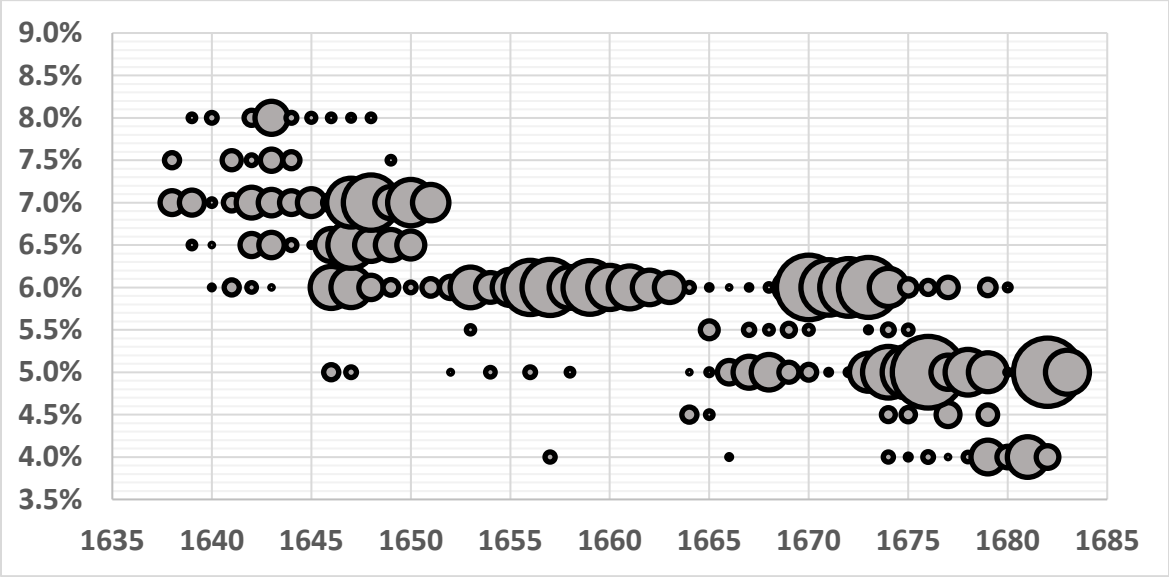
The data on bond assignability completes our picture of financial deepening: the assets created by the Corporation could not only be held for any duration but also became negotiable. Negotiability, or liquidity, of the bonds, made them not only a means to diversify financial investments (compared with bank deposits) but also offered an advantage of liquidity that bank accounts do not (Kiyotaki & Moore 2005).

2.3.2 Borrowing interest rates

The Corporation of London did not issue standardized bonds. It borrowed varying amounts from various types of individuals and using a variety of debt instruments. Therefore, we would expect some heterogeneity in the rates of interest offered to its lenders. In **Figure 9**, we group loans to the Corporation by the interest paid. The bubble size represents the amount of lending at a given interest rate for every year. We can see that lending rates, within a year, were concentrated. However, some variation, up to 200 basis points, occurred within the year. The heterogeneity of interest rates suggests that the Corporation was not borrowing at a predetermined institutional rate. Instead, it was active in a credit market.

Figure 9

Interest paid on all loans: 1638-1683

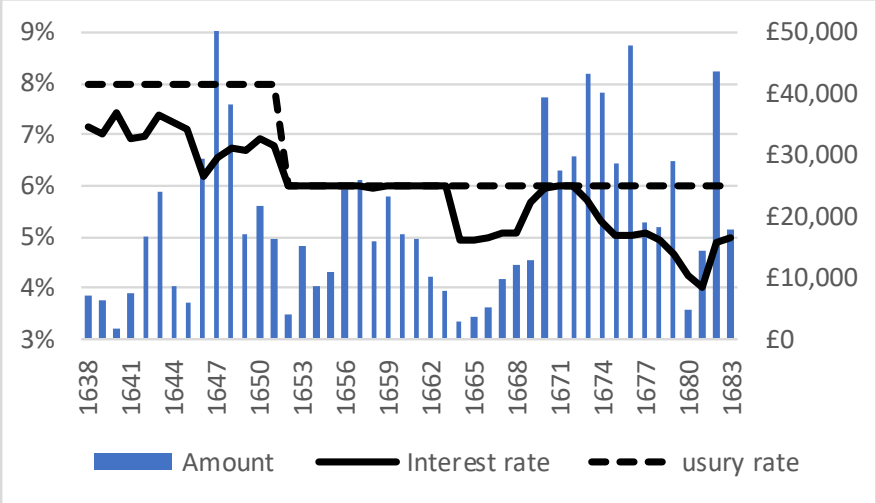


Sources: COL/CHD/LA/01/001, and 002.

The data extracted from the loans recorded in the accounts also allow us to construct a macroeconomic time series of borrowing rates for the Corporation of London. We report annual borrowing rates calculated using a weighted (by loan size) average of all bonds' borrowing rates. In **Figure 10**, we plot the weighted borrowing rate together with the amounts borrowed and the usury ceiling. One can note a clear downward trend in the interest rate series. From 1640 to 1680, borrowing rates declined by 350 basis points to 4%. Interest rates declining before the Civil War and in 1651, reached 6%. In 1651, the Commonwealth Parliament lowered the usury rate from 8% to 6%. Charles II reaffirmed the act after the Restoration in 1661.

It is likely that during ' 'Cromwell's protectorate and the initial years of the Restoration, the usury rate was a binding constraint on borrowing rates (Munro 2003). Beginning in 1664, we observe a decline of interest rates towards 5% (in 1665). The rebuilding of London after the Fire and the outbreak of the Third Anglo-Dutch War placed considerable demands on the capital market. By 1672 during the Crown's default - the Stop of the Exchequer - rates reached 6% again. However, the peak was short-lived, and already in 1673, rates started their rapid descent and reached 4% by 1681. In 1682, when the Corporation of London borrowed heavily to avert default, rates increased to 5%. Our series ends in 1683 when the City defaulted on its debt services and stopped borrowing.

Figure 10
Borrowing by the Corporation of London: 1638-1683



Sources: COL/CHD/LA/01/001-002; COL/CHD/CT/01/002-0017.

In January 1672, Charles II stopped paying interest on loans he raised mainly to finance the fleet (Horsefield 1982). The infamous 'Stop of the 'Exchequer' lasted throughout the 1670s. In 1677, the treasury paid interest on the defaulted debt at 6% (Li 2019). Li (2019, table 7) shows that discounted defaulted debt was trading in the secondary market at an average rate of 15%.[29] Simultaneously, unsecured borrowing by the Corporation of London, albeit constrained by the usury ceiling, was financed at some 200 basis points *less* than the sovereign debt.[30]

The decline of borrowing rates, especially after 1660, supports Roseveare's (1991) claims that the Restoration marked the beginning of the Financial Revolution in England. During the reign of Charles II, interest rates on the Corporation of London's debt further declined by 200 basis points to reach 4%. The rate of 4% would be reached again only in the 1720s and remained the average Consol yield in the 18th century (Sussman & Yafeh 2006). These findings offer further evidence that the Glorious Revolution's effect on borrowing costs was not as significant as claimed by North and Weingast (1989).

3 The determinants of interest rates paid by the London Corporation

In this section, analyze the macroeconomic determinants of the Corporation of London's borrowing cost. We test the hypothesis that the decline in the cost of borrowing of the Corporation of London reflects both the declining interest rates in Europe proxied by the cost of borrowing in Amsterdam and the financial deepening we documented above. We begin by presenting the empirical framework that we use to test econometrically for the determinants of the cost of capital. We then present and discuss the results of the estimations.

3.1 Empirical framework

In the previous section, we established that the Corporation of London acted as a significant financial institution in London during the 17th century alongside Goldsmith Banks. It, therefore,

[29] Milevsky (2017) calculated the internal rate of return on the defaulted debt held from default to 1706 was around 1%.

[30] Following Quinn (2001), in the ***short run***, the king's default probably resulted in a substitution effect in financial markets that increased the supply of funding available for safer borrowers like the Corporation of London.

competed in a market for deposits and faced a perfectly elastic supply of capital. Following the bond pricing literature (Acharya et al. 2013), the cost of borrowing of a particular borrower i_t, is equal to the time-varying risk-free rate r_t plus a time-varying risk premium α_t, and a time-varying liquidity premium l_t.[31]

$$(1)\ i_t = r_t + \alpha_t + l_t$$

The assumption of an elastic supply of capital allows us to identify a causal relationship between the supply of capital and its price. When capital is perfectly elastic, the *price* is determined according to equation (1) and the *quantity* according to demand. From the Restoration to 1680, England's annual trade surplus doubled from about 500,000 to 1 million Pounds.[32] This implies that England accumulated almost 15 million pounds of financial claims on its trading partners over this period of twenty years. While the Corporation was not a marginal financial actor, it was small enough relative to these large volumes of capital such that its demand for capital did not affect its price.

The equation for estimation is:[33]

$$(2)\ i_t = c + \beta r_t + \gamma_i \alpha_{it} + \delta l_t + u_t$$

Following Sussman and Yafeh (2006), we assume that Amsterdam is the European financial center and considers the government's debt of the province of Holland as the risk-free financial asset of the time.[34] We justify our assumption that the Amsterdam rate is relevant for investors by recalling that a significant number of the lenders to the Corporation also banked with Backwell Bank that was engaged in discounting bills with Amsterdam. Therefore, r_t is proxied by Dutch yields. In ***Figure 1*** we presented the Corporation's weighted borrowing rate and two measures of the cost of capital for the province of Holland. The first, based on Gelderblom and Joonnker (2016), is the tax-free market yields of the provinces' debt, and the second, based on the average cost of capital from the financial accounts of the Province of Holland (Fritschy 2017). Fritschy used a similar

[31] We abstract from other premia such as the cost of moving capital between Amsterdam and London.
[32] A millennium of macroeconomic data for the UK, Table A35.
[33] The historical literature, Grassby (1969) and Habakkuk (1952) claim that the supply of funds to the Corporation of London was indeed elastic.
[34] Capital markets in Europe at the time were integrated (Li 2019b) and many cities shared a common trend (Stasavage 2011). Since my only concern is with developments in London, I wish to avoid a debate on the supremacy of Amsterdam's financial market and use Amsterdam as the risk-free rate owing to annual data availability. In the appendix we estimate the regression using also a borrowing rate of Genoa, another major European financial center.

measure of the costs of capital as in Sussman and Yafeh (2006) and divided interest payments by the stock of debt outstanding. The co-movement of the yield series is shown in ***Figure 1***. In our principal analysis, we used the series provided by Fritschy (2017).[35]

Stasavage (2011, chap. 4) used the real interest rate as the risk-free rate. Therefore, an alternative specification could have used Greg Clark's (2010, table 7) real return on capital series. Since we are trying to account for nominal borrowing rates, using a real interest rate as a benchmark requires controlling for inflation expectations for which we have no data. Moreover, Clark's real rate corresponds to long-term rates as it assumes away differences between land price inflation and general price level inflation. Our approach is consistent with the sovereign debt literature that examines the nominal spread between bonds to account for risk and liquidity premiums. Finally, the real interest rate series is decennial, whereas our data is annual. [36]

To account for the time-varying risk premium of the Corporation of London, α_{it} we introduced a set of dummy variables that capture England specific events. The English civil war: 1642 to 1648; the Protectorate: 1649 to 1659; The year of the Restoration (1660); The three Anglo-Dutch Wars (152-4, 1663-5, 1672-4) The Stop of the Exchequer, 1672, when King Charles II defaulted on the interest payments of the government's debt. Two notable events that affected London were the plague of 1665 and the Great Fire of 1666. We also calculated some financial ratios related to the fiscal borrower-risk of the Corporation of London: i. The budget deficit, ii. The debt to income ratio (leverage), iii. The debt service to income ratio, iv. The current ratio – cash reserves to current liabilities.[37]

Liquidity affects asset prices and returns (Amihud et al. 2006). In our analysis, the liquidity premium l_t of the interest rate differential captures financial deepening (Kiyotaki & Moore 2005). To proxy for financial deepening, we use two measures: the outstanding stock of debt of the Corporation of London divided by nominal GDP (Sahay et al. 2015) and the percent of assigned bonds out of total bonds outstanding. The literature on corporate debt assumes and has empirically validated that the larger the debt, the more liquid it is (Houweling et al. 2005). Habakkuk (1952)

[35] The Gelderbloom and
series did not perform as well, see Table A-6 columns 3-5 in the Appendix.
[36] On econometric grounds, the real rate of return calculated by Clark (2010) is stationary and therefore not cointegrated with the Corporation of London borrowing rate.
[37] As we saw above, the average duration of the loans contracted by the Corporation of London was about four years, we calculate the current ratio as the cash reserves divided by a quarter of the debt.

and Keirn and Melton (1990) attribute part of the decline in interest rates in London in the 17th century to the increased liquidity of the Corporation of 'London's debt. Ventura and Voth (2015) argue that rising public debts in England in the 18th century had crowding-out effects and increased the liquidity of debt assets that crowded in financial investment from more traditional (e.g., land) investments.

The cost of borrowing by the Corporation of London was likely constrained by the usury law of 1651 (**Figure 10**). Because for some years, we believe that our outcome variable, the cost of borrowing, is censored, we estimated equations (2) using censored (Tobit) regressions. In our estimations, we also controlled for the composition of borrowing by bond type to capture any possible effect the type of bond could have on the borrowing rate.[38]

3.2 Results

We estimated the cost of borrowing for the Corporation of London using equations (2) and present the results of our preferred estimations in **Table 3**, columns (1) to (3). Complete estimation results appear in Appendix ***Table A- 6***.

Our main result shows that the Corporation of London's borrowing rates, our dependent variable, co-moved with Dutch rates. The coefficient of the Dutch borrowing rate in all our regressions is not significantly different from 1. This result supports the qualitative evidence presented above that the London and Amsterdam capital markets were interconnected. Put differently, this result also suggests that the decline in interest rates we observe in London was not significantly different from that on the Continent[39].

[38] Because our dependent variable is censored, accounting for unit roots is not straightforward. In the Appendix, we show that our variables are integrated of order 1 (***Table A- 2***). We test for cointegration in several ways: We ran a cointegration rank test (***Table A- 3***) and obtained a single cointegrating equation. We used a traditional ADF cointegration test using only the uncensored observations (***Table A- 4***). Finally, we provide estimates of FOMLS and DOLS estimations of the model (***Table A- 5***) that show that the London and Amsterdam interest rates are cointegrated with a coefficient of unity. Therefore, albeit imperfect tests of cointegration, we cannot reject cointegration.

[39] For European rates see Stasavage (2011 fig. 2.2). In column (6) in Table A-7 we add, for comparison, the borrowing rate for Genoa. The results show that the Dutch rate dominates the Genoese rate in explaining the London Rate.

Table 3
Estimating annual borrowing costs of the Corporation of London

	(1) i_t	(2) i_t	(3) i_t
Dutch rate	1.216***	1.024***	0.891***
	(0.147)	(0.129)	(0.104)
Share assigned		-0.025**	
		(0.011)	
Debt to GDP			-0.004***
			(0.001)
Current ratio		-0.002***	-0.002***
		(0.001)	(0.000)
Deficit		0.001	0.002***
		(0.001)	(0.000)
Restoration		0.020***	0.011***
		(0.002)	(0.001)
Anglo-Dutch III		0.002	0.002**
		(0.001)	(0.001)
Constant	0.002	0.007	0.014***
	(0.007)	(0.006)	(0.005)
AIC	-289	-306	-328
BIC	-284	-290	-312
N	46	46	46

Standard errors are in parenthesis
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Source: COL/CHD/CT/01/002-017. Dutch rates: Wantje Fritschy Gewestelijke Financiën ten tijde van de Republiek der Verenigde Nederlanden 1572-1795,. GDP from Broadberry et al. (2011). Dummy variables equal 1 for Restoration (1660); Third Anglo-Dutch War (1672-4).
Regressions were estimated using *Tobit* in Stata with weighting by annual loan amount using robust standard errors. The debt to GDP, current ratio, and deficit were standardized.
Descriptive statistics for the data used are provided in Appendix Table A-1.

Interest rates in London not only co-moved with Amsterdam, but they also *converged* by 1680 (***Figure 1***). Financial deepening as captured by either the share of assigned bonds out of total bonds (column 2) or the Corporation debt to British GDP ratio (column 3), contributed to this convergence. The regression results also show that the Corporation's time-varying risk premium also significantly affected the Corporation's borrowing costs. While the regression results (columns 2 and 3) are very similar, those based on the Corporation debt to British GDP ratio are somewhat more significant. The AIC and BIC information criteria point in that direction too. In the following analysis, we discuss the results reported in column 3.[40]

Interest rates in London co-moved with those of Amsterdam and the regression coefficient is equal to 1. We can frame the analysis of the convergence of interest rates between the two financial centers in terms of the spread - the yield difference between London and Amsterdam. We sum all

[40] Since we are using censored (Tobit) regressions we do not report R^2. However, We used OLS regressions to get a rough estimate of the explanatory power of our regressions: 0.65, 0.8 and 0.82 respectively.

the risk premia effects (the deficit, the current ratio, and the impact of the Restoration and the Third Anglo-Dutch War) and compare them with the effect of financial deepening as captured by the Corporation debt to British GDP ratio.

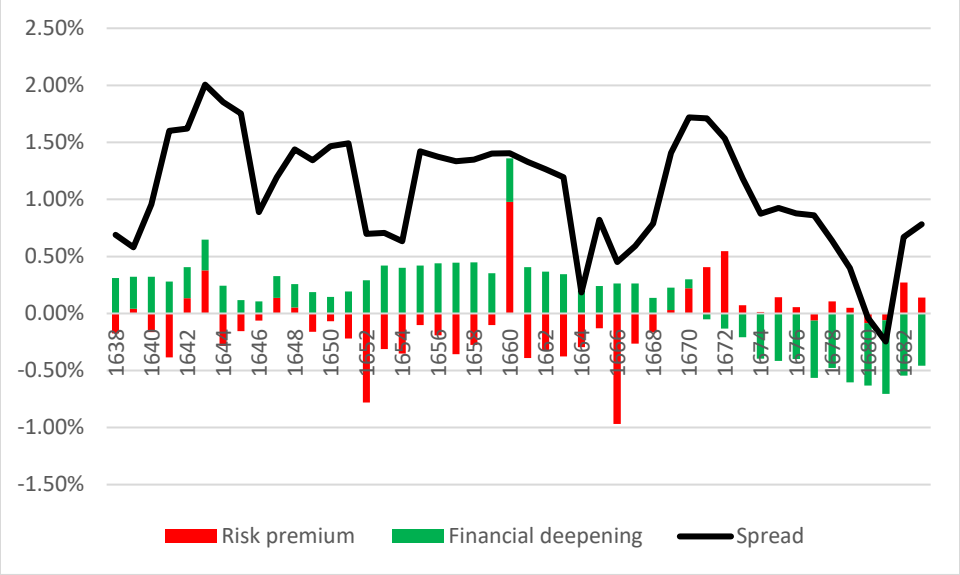
Our findings show (**Figure *11***) that until the Restoration, the spread was relatively stable. During that period, the sound fiscal state of the Corporation finances, captured by low deficits, and a healthy cash flow contributed to lowering the spread. In contrast, the relatively small scale of debt operations and the fact that no secondary market for bonds existed was reflected in a positive liquidity premium. The decline in the spread after 1670 is associated with a reduction in the liquidity premium as financial deepening. We capture this effect by the coefficient of the debt to GDP ratio. The deteriorating balance sheet of the Corporation and the effect of the Third Anglo-Dutch War and the associated royal default and banking crisis mitigated to a minor extent, the strong positive effect of financial deepening. In all, financial deepening, captured by the liquidity premium, accounts for about 100 basis points reduction in the difference in the borrowing costs between London and Amsterdam.

It is interesting to note that only two events significantly impacted the Corporation's borrowing costs. According to our regression results, the Restoration in 1660 was associated with a significant increase of 110 basis points in borrowing costs. This may suggest that financial markets viewed, ex-ante, the Restoration as a risk to financial markets in general, and the Corporation of London in particular. Ex-post, the Restoration, especially most of the reign of Charles II, was a period that favored the development of financial markets. The Third Anglo-Dutch War (1672-4) also significantly increased the Corporation's borrowing costs, but the impact was relatively small, a mere 20 basis points increase.

Our interpretation of the contribution of financial deepening to the convergence of borrowing rates between London and Holland could be challenged by an argument that after the 'Stop of the Exchequer,' the Corporation benefitted from flight-to-safety capital flows. Therefore, the decline in the cost of capital should have been captured by a decline in the risk premium on the Corporation debt, rather than by the debt to GDP variable or share of assigned debt that we used to capture financial deepening. Empirically the effect of a missing flight-to-safety variable would be captured by the residuals of the regression. Inspection of the residuals (***Figure A1*** in the Appendix) shows

that except for 1680, when the actual borrowing rate was lower than the predicted rate, the specification we used accounts for the convergence of rates.

Figure 11
The spread between interest rates in London and Amsterdam and its determinants: Liquidity and time-varying risk: 1638-1683



Note: Based on the estimation results reported in **Table 3**, col. 3.

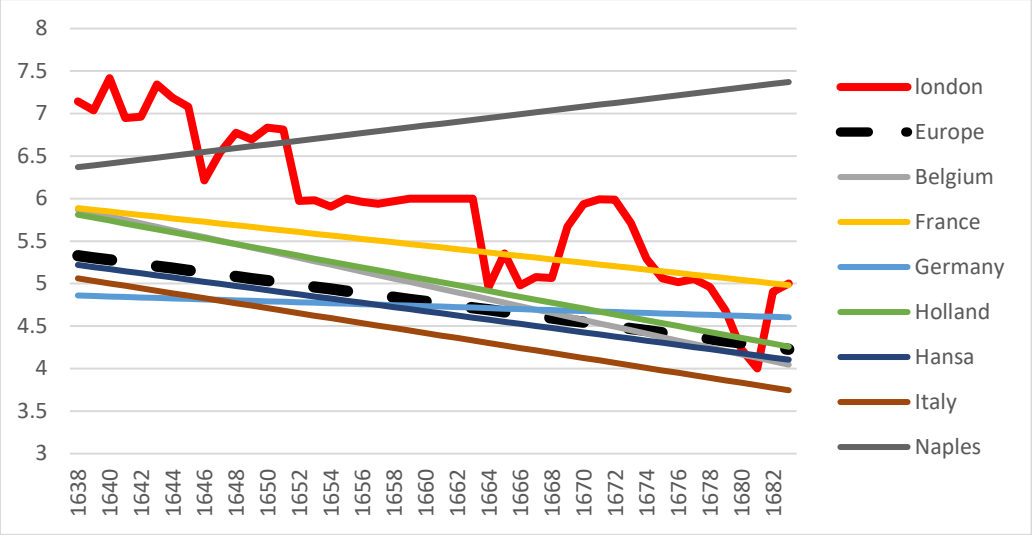
3.3 Comparison with European Municipalities

To provide additional robustness, we compare London borrowing rates to those of municipalities on the Continent. For comparison, we utilize the data collected by Chilosi et al. (Chilosi et al. 2018). For the period 1638 to 1683, only three cities have almost complete data: Genoa, Sienna, and Hannover. The City, with the strongest correlation is Genoa (See Appendix Table A-6). To account for the incomplete data from individual cities, we grouped 49 cities into seven geographical/political regions: Belgium, France, Germany, Hansa, Holland, Italy, and Naples. We then used panel data estimation to estimate time trends for each region.

Except for the Kingdom of Naples, all regions exhibited a decline during the period (***Figure 12***). The largest decline was in Belgium, and the smallest was in Germany. However, when compared to European municipalities, the *convergence* of the London rates is also apparent. These results strengthen our conclusion that London was integrated with financial developments on the

Continent and experienced financial developments that brought its borrowing rates from the highest to be amongst the lowest in Europe before the default in 1683.

Figure 12
Trends in European municipal borrowing rates (percent): 1638-1683



Sources: (Chilosi et al. 2018) https://journaldata.zbw.eu/dataset/1d5fb8dc-7443-4ffe-917a-547fd2f8ce14/resource/3c3ccfb0-519d-4601-8412-2750908f233b
Linear time trends estimated from panel data estimation with City fixed effects based on 49 municipalities grouped into seven regions. The rate for Europe is the average time trend of all municipalities.

4 Estimating the risk premium on unsecured debt

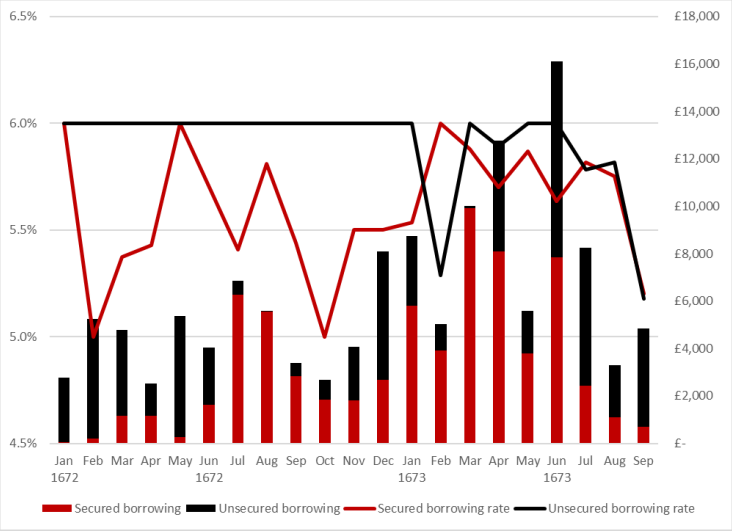
The Corporation of London borrowed throughout the period without offering any collateral or employing a sinking fund to assure investors. For two years, 1672 and 1673, the Corporation of London borrowed both on its own, unsecured, credit, and on the security of the Coal Tax receipts. The collection of a Coal Tax was granted by Parliament to the Corporation of London to finance the public rebuilding projects.[41] The practice of assigning tax revenues earmarked to repay borrowing emerged, according to Murphy (2013), during 'Downing's tenure at the exchequer in the 1660s.[42] The total amount borrowed on either account from January 1672 to September 1673 was comparable - £69,000 and £61,000, respectively. In **Figure *12***, we plot the weighted (by loan amount) average of monthly borrowing rates and the corresponding borrowing amounts. We can divide the period into two – the first, from January 1672 to January 1673, and the second from

[41] For further discussion, see Coffman et al. (2019).
[42] Coffman (2013) argues that this development occurred much earlier.

February to September 1673. During the first sub-period, the unsecured borrowing rate was 6%, and that of the secured borrowing was lower. The average monthly risk premium - the difference between the two borrowing rates - was about 50 basis points in that sub-period.

In the second sub-period, the spread between the borrowing rates is much smaller and eventually disappeared. One possible explanation for the reduction in the spread is the perception that the precedent of granting the Corporation of London the right to collect a tax could be applied in other circumstances. This explanation is consistent with the literature on the effect of the fiscal capacity and the cost of (sovereign) borrowing.[43] Alternatively, once the effect of the financial crisis triggered by the 'stop of the 'exchequer' subsided and interest rates declined (**Figure 1**), the premium commanded by secured debt disappeared. This explanation suggests that in typical times, reputation may be as good as collateral. During a financial crisis, investors prefer a harder commitment.[44] This finding offers additional support to the claim that flight-to-safety motives did not drive the decline of borrowing rates we observe in the 1670s. Because during a crisis, investors preferred secured to unsecured (Corporation) debt.

Figure 13
Secured versus Unsecured Borrowing by the Corporation of London: 1672-1673



Sources: COL/CHD/LA/01/001 and COL/CHD/DM/01/001.

[43] In the British historical context see: Seghezza (2015) and O'Brien (2002).
[44] For theoretical explanations, see Gorton and Ordonez (2014) and Ordoñez (2013).

5 Conclusions

The financial development of London in the 17th century, as reflected in borrowing costs of the Corporation of London, advanced along similar lines to those of its rival Amsterdam. In both countries, like most other countries on the Continent, the cost of capital declined through the 17th century by between 300 and 400 basis points. The supply of capital came mainly from London's wealthy citizens and the gentry who resided in its vicinity. During the 17th century, and especially after the Restoration, the economy experienced financial deepening. The volume of financial assets held by individuals increased, the number of bondholders increased, bonds started to be assigned in a secondary market, and investors diversified their portfolio of financial assets, holding bank deposits as well as Corporation of London's debt. The amount of the Corporation of London's debt alone increased threefold.

We show that the spread between London and most municipalities on the continent was eliminated by 1680. The closing of the *spread* is primarily explained by financial deepening. The similarity between interest rates in England and the decline in the spread mainly during the reign of Charles II provides another piece of the story of the emergence of British economic supremacy. It dates back to the mid-17th century.

In an age when governments did little to finance growth, the relevant prism to evaluate the finance-growth nexus should be the development of non-governmental financial intermediaries. The contribution of the state was to allow them to operate. In that regard, the 'Quo 'Warranto' revocation of the Corporation of London's rights in 1683, after its default, is perhaps the equivalent of allowing a systemically important bank to fail. The restoration of the rights of Corporation by the Parliament in 1688, immediately flowing the Glorious Revolution, the restructuring of its debts and providing it with tax revenues to service and repay the debt, can be viewed as a 'bail-out.' This bail-out and financial restructuring increased the public's confidence in financial markets. We conclude this paper with yet another twist in the story of the Glorious Revolution's contribution to the (continuation of) the financial revolution and economic growth in Britain.

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Appendix

Table A- 1
Summary statistics of the data used in the regressions

Variable	Mean	Std. Dev.	Min	Max
Interest rate	0.058	0.007	0.040	0.074
Holland rate	0.046	0.005	0.041	0.065
Share assigned	0.062	0.060	0	0.226
Debt to GDP	0.000	1.011	-1.352	1.941
Current ratio	0.000	1.011	-1.029	2.875
Deficit	0.000	1.011	-4.168	1.422

Notes: Interest rate weighted by loan amount. Holland rate: average cost of debt from Wantje Fritschy Gewestelijke Financiën ten tijde van de Republiek der Verenigde Nederlanden 1572-1795. Province of Holland rate G-J: market prices communicated by Gelderbloom and Jonker. Debt and deficit in millions of pounds.

Table A- 2
Results of Augmented Dickey-Fuller unit-root tests

	level	first difference
Variable	ADF p-value	ADF p-value
Interest rate	0.4834	0
Holland rate	0.0948	0
Debt	0.9614	0
Current ratio	0.1014	0
Deficit	0.2684	0

Table A- 3
Cointegration rank test

Number of cointegrating vectors	trace statistic	critical value
0*	83.972	60.061
1	37.211	40.175
2	17.404	24.276
3	0.982	12.321

Notes: Estimated regression*: equation* (2) $i_t = c + \beta r_t + \gamma_i \alpha_{it} + \delta l_t + u_t$
Johansen method with a trend.

Table A- 4
Result of Augmented Dickey-Fuller unit-root test, residuals from equation (2): $i_t = c + \beta r_t + \gamma_i \alpha_{it} + \delta l_t + u_t$

Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
-4.864	-2.62	-1.95	-1.61

Notes: Based on estimating an OLS regression for 34 observations where the usury ceiling was not binding. Test on levels without constant.

Table A- 5
Results of cointegration regressions using equation (2): $i_t = c + \beta r_t + \gamma_i \alpha_{it} + \delta l_t + u_t$

	(1)	(2)
Method	FMOLS	DOLS
r_t	1.009***	1.090***
	(8.76)	(7.62)
l_t	-0.003***	-0.004***
	(-4.04)	(-4.2)
current ratio	-0.002***	-0.003***
	(-2.13)	(-2.69)
deficit	0.002***	0.003***
	(3.62)	(3.03)
N	45	43
adj. R^2	0.819	0.92

Notes: FOMLS: Cointegrating equation deterministic: C; Long-run covariance estimate (Bartlett kernel, Newey-West fixed bandwidth = 4.0000). DOLS: Cointegrating equation deterministic: C; Long-run covariance estimate (Bartlett kernel, Newey-West fixed bandwidth = 4.0000); Lead=1, lag=1.

Table A- 6
Alternative estimation results

	(1) i_t	(2) i_t	(3) i_t	(4) i_t	(5) i_t	(6) i_t
Holland	1.009***	0.709***	0.229	-0.279	0.315**	0.628***
	(0.180)	(0.161)	(0.287)	(0.177)	(0.127)	(0.180)
Genoa						0.318
						(0.193)
Share assigned	-0.023*			-0.047***		
	(0.013)			(0.016)		
Debt to GDP		-0.004***			-0.006***	-0.004***
		(0.001)			(0.001)	(0.001)
Current ratio	-0.002**	-0.002***		-0.000	-0.002**	-0.002**
	(0.001)	(0.001)		(0.001)	(0.001)	(0.001)
Deficit	0.000	0.002***		-0.001	0.002**	0.002**
	(0.001)	(0.001)		(0.001)	(0.001)	(0.001)
civil war	0.000	0.002		0.010***	0.005***	
	(0.002)	(0.002)		(0.002)	(0.002)	
Parliament	-0.000	0.001		0.001	-0.000	
	(0.002)	(0.002)		(0.002)	(0.002)	
Restoration	0.020***	0.010***		0.026***	0.012***	0.010***
	(0.003)	(0.001)		(0.004)	(0.002)	(0.001)
Plague	0.005	-0.002		0.000	-0.004	
	(0.004)	(0.003)		(0.005)	(0.005)	
Fire	0.001	0.001		-0.006	-0.001	
	(0.004)	(0.003)		(0.004)	(0.003)	
Stop of Exchequer	0.000	-0.003*		0.005	-0.003	
	(0.003)	(0.001)		(0.003)	(0.002)	
Anglo-Dutch III	0.002	0.003***		0.002	0.006***	0.003***
	(0.002)	(0.001)		(0.003)	(0.002)	(0.001)
Constant	0.007	0.022***	0.049***	0.066***	0.043***	0.018***
	(0.009)	(0.008)	(0.012)	(0.007)	(0.005)	(0.005)
Obs.	46	46	46	46	46	46

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Source: COL/CHD/CT/01/002-017. Dutch rates: Wantje Fritschy Gewestelijke Financiën ten tijde van de Republiek der Verenigde Nederlanden 1572-1795,. GDP from Broadberry et al. (2011). Dummy variables equal 1 for Restoration (1660); Third Anglo-Dutch War (1672-4).
Regressions were estimated using *Tobit* in Stata with weighting by annual loan amount using robust standard errors. The debt to GDP, current ratio, and deficit were standardized.
Holland rate: Colum (1) and (2) based on Fritschy, columns (3)-(5) based on Gelderbloom and Jonker.
Genoa rate from (Chilosi et al. 2018) https://journaldata.zbw.eu/dataset/1d5fb8dc-7443-4ffe-917a-547fd2f8ce14/resource/3c3ccfb0-519d-4601-8412-2750908f233b

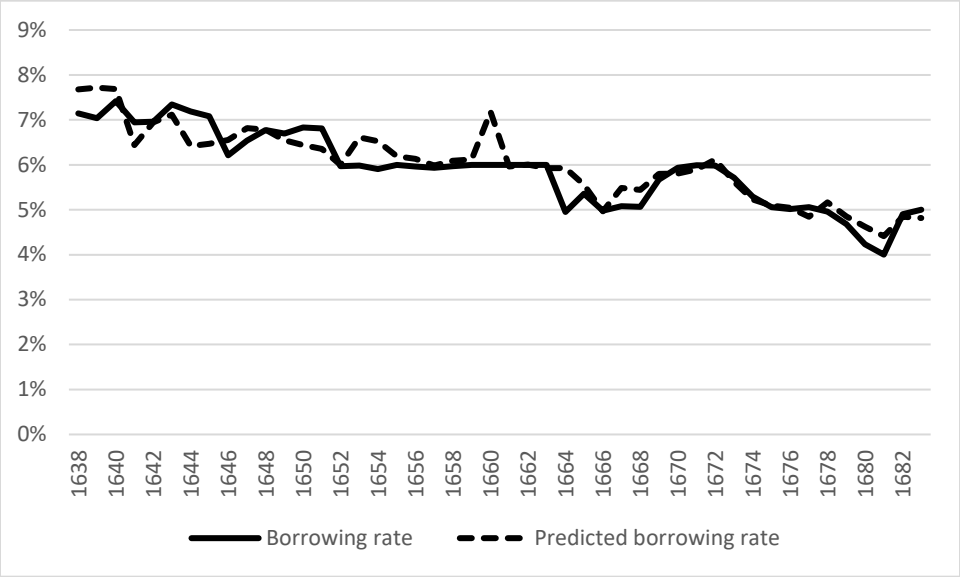
Table A- 7
Survival regression on duration to redemption

	(1)	(2)
Loan amount	-0.000***	-0.000***
	(0.000)	(0.000)
Alderman	-0.644***	-0.507***
	(0.137)	(0.159)
Gent	-0.205*	-0.108
	(0.106)	(0.111)
Non-City	0.041	0.076
	(0.103)	(0.135)
Spinster	0.066	0.133
	(0.098)	(0.098)
Widow	0.242***	0.283***
	(0.080)	(0.098)
Annuity	0.648***	0.760***
	(0.187)	(0.250)
Note	-0.800***	-0.868***
	(0.201)	(0.165)
Short	-0.766***	-0.823***
	(0.197)	(0.205)
Assigned third-party	0.522***	0.521***
	(0.109)	(0.120)
Assigned heir	0.683***	0.680***
	(0.107)	(0.112)
Assigned to Husband	-0.221	-0.271*
	(0.180)	(0.161)
Restoration	-0.264***	
	(0.083)	
Stop of Exchequer	-0.145***	
	(0.046)	
Plague	0.503***	
	(0.151)	
Fire	-0.357**	
	(0.144)	
Parliament	-0.037	
	(0.102)	
installment	0.973***	0.971***
	(0.075)	(0.052)
Constant	6.805***	7.990***
	(0.081)	(0.636)
lnsigma	0.114***	0.071**
	(0.025)	(0.028)
kappa	0.643***	0.711***
	(0.080)	(0.071)
Obs.	2162	2162
Year fixed effects	No	Yes
Clustered errors	Year	ID

Standard errors are in parenthesis
*** p<0.01, ** p<0.05, * p<0.1
Estimated using ***streg*** in Stata, gamma distribution.

Figure A-1

Actual versus predicted borrowing rates
Corporation of London: 1638-1683



Based on estimation results in Table 3 column 3.

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